



UNIVERSITY of WISCONSIN-MADISON
Computer Sciences Department

CS 202
Introduction to Computation

Professor Andrea Arpaci-Dusseau
Fall 2010

Lecture 22:
**How can computation...
help visualize data?**

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Steve Meyers

"That's the one day we experimented with giving our employees guaranteed job security."

Comment on Other Projects

5 comments due by 5pm Today

Find projects that do not have 5 comments yet!

Demo Day on Wednesday

Class is held in CS 1370

Everyone is expected to attend

- Students with lastnames starting A-K will demo
- Other students test and will demo Project 2 later...

5 minutes to set up

- Do not run from webpage!
 - Bring laptop (charged!) with game ready
 - Or, log in to CS machines (get account ahead of time!)
 - Game on USB or loaded into
- Student A-F demo 10:00 - 10:20
- Students G-K demo 10:25 - 10:45

Everyone not doing demo: Play and give comments!

Project 1 Help

TA lab hours

Monday 12:30 - 2:15

Tuesday 4-6

Professor office hours (none Wednesday)

Tuesday 1:30 - 3:30

Send email to cs202-tas@cs.wisc.edu

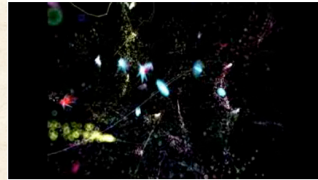
Today's Topic: Data Visualization

TED talk

"Demo: Stunning data visualization in the AlloSphere"

- See, hear and interpret scientific data
- Dive into the brain, feel electron spin, hear the music of the elements
- 6 minutes

http://www.ted.com/talks/joann_kuchera_morin_tours_the_allosphere.html



Today's Topic: Data Visualization

TED talk

Hans Rosling: "Let my dataset change your mindset"

- Visualizing time-series data sets can give new insights
- Data-bubble software bursts myths about the developing world (health, wealth)
- 20 minutes

http://www.ted.com/talks/hans_rosling_at_state.html#



Steps towards Visualization in Scratch

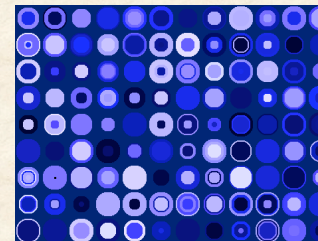
```

when green flag clicked
  clear
  set pen color to blue
  forever
    go to x: pick random -6 to 5 * 40 + 20 y: pick random -4 to 4 * 40
    set pen size to pick random 2 to 9 * 4
    set pen shade to pick random 1 to 100
    pen down
    pen up
  
```

Forever

- Goto random location on grid
- Stamp random shade of blue
- Random size within space

What is result of running Scripts?



Forever

- Goto random location on grid
- Stamp random shade of blue
- Random size within space

2: What will these scripts do?

Stage scripts

```

when clicked
  broadcast start
  clear

when I receive start
  delete all of Pen Color
  delete all of Pen Shade
  repeat 10
    add pick random 1 to 100 to Pen Color
    add pick random 1 to 100 to Pen Shade
  broadcast ok
  
```

Initializes two lists:
Pen Color and Pen Shade

How long is each List?

2: What will these scripts do?

```

when I receive ok
  hide
  pen up
  go to x: 0 y: 0
  set pen size to 3
  set y to 0
  repeat until y > 171
    set x to 0
    repeat until x > 231
      set c to pick random 1 to 10
      broadcast draw and wait
      change x by 10
      change y by 10
    broadcast start

when I receive draw
  pen up
  set pen color to item c of Pen Color
  set pen shade to item c of Pen Shade
  go to x: x y: y
  pen down
  pen up
  go to x: -1 * x y: y
  pen down
  pen up
  go to x: x y: -1 * y
  pen down
  pen up
  go to x: -1 * x y: -1 * y
  pen down
  pen up
  
```

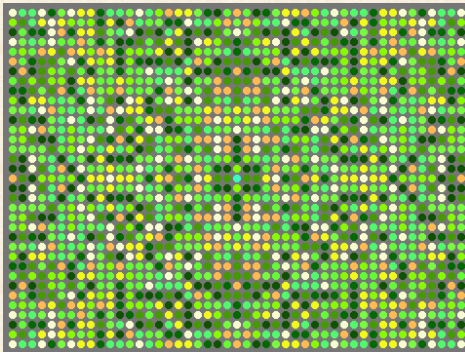
How are x, y varied?

How many pen points
for each x,y?

What is relationship
of two Lists?

What is purpose of
c?

Result of Running Scripts



Symmetric picture along both x and y axis (4 quarters)
Ten different color/shade combinations

3: What will these scripts do?

```

when clicked
  hide
  pen up
  clear
  set Max X to 240
  set Min X to -240
  broadcast Draw Function and wait

when I receive Draw Function
  set pen color to black
  set x to Min X
  set y to abs of x
  pen down
  repeat until x = Max X
    set y to abs of x
    go to x: x y: y
    change x by 1
  
```

What if don't set Y in repeat loop?

How to make function draw faster?

What if change from abs to mod?

```
set y to x mod 20
```

What change from abs to x*x?

```
set y to x * x
```

Problem with plot of $Y = X * X$?

Value of Y goes above Stage coordinates for most values of X!
Possible way to fix?

Problem with plot of $Y = X * X$?

Interested in $Z = X * X$; Scale the computed value of Z so fits in Y coordinates
Calculate $Z = X * X$; compute $Y = Z / \text{MAX } Z * \text{MAX } Y$

How to draw scaled $y = x * x$?

How to scale plot of $y = x * x$?

```

when clicked
  pen up
  hide
  clear
  set Max X to 240
  set Min X to -240
  set Max Y to Max X * Max X
  set Min Y to 0 - Max Y
  broadcast Draw Axes and wait
  broadcast Draw Function and wait

when I receive Draw Axes
  set pen color to blue
  go to x: -240 y: 0
  pen down
  go to x: 240 y: 0
  pen up
  go to x: 0 y: 180
  pen down
  go to x: 0 y: -180
  pen up

when I receive Draw Function
  set pen color to blue
  set X to Min X
  repeat until X = Max X
  set Y to X * X
  set Scaled Y to Y / Max Y * 180
  go to x: X y: Scaled Y
  pen down
  change X by 5
  
```

Today's Summary

Today's topic

- Visualizing data can help everyone better understand the world we live in

"Reading"

- TED talks linked on Course Schedule page
- Please watch!

Announcements

- Project 1 due Wed before 9:55
- Demo in CS building
- Exam 1 graded, returned; solutions on webpage